FINAL DRAFT SUMMARY REPORT

MUNI-BART COORDINATION PLAN

De Leuw, Cather & Company
June, 1974

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MUNI-BART COORDINATION PLAN

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Organizations and institutions that have participated directly in the Muni-BART Coordination Project include:

1. All People's Coalition
2. Balboa Terrace Homes Association
3. Bayview-Hunter's Point Coordination Council
4. Bernal Heights Association
5. Cayuga Improvement Association
6. Clementina Towers Association
7. Communities of the Outer Mission Organization
8. Eureka Valley Promotion Association
9. Excelsior Merchants Association
10. Geneva-Mission Businessmen's Association
11. Jitney Owner's Association
12. Lisbon/Madrid Block Club
13. Miraloma Park Improvement Club
14. Mission Coalition Organization
15. Mission Coalition Organization Planning Committee
16. Mission Merchants Association
17. New Mission Terrace Improvement Association
18. Ocean View-Merced Heights-Ingleside Community Association
19. Parkmerced
20. San Francisco City College
21. San Francisco Planning and Urban Renewal Association
22. California State University, San Francisco
23. Stonestown Merchants Association
24. Visitacion Valley Improvement Association
25. Woodrow Wilson High School

[illegible] of Twin Peaks Central Council

[illegible]

STUDY OBJECTIVES

Since the mid-1960's the three public transit operators in San Francisco, Alameda, and Contra Costa Counties -- BART and Muni in San Francisco and AC Transit in the East Bay -- have realized that a plan that would reorient bus routes and facilitate the transfer of passengers from feeder buses to rapid rail lines was needed to optimize use of the Bay Area's transit system and to derive the greatest benefit from the $1.6 billion BART investment. To meet this need, the Federally-funded Northern California Transit Demonstration Project (NCTDP) was undertaken in 1965 to develop recommendations for rerouting, transfer procedures, and fare discounting. The study produced various plans and stimulated interest in coordination; however, no working agreement was signed by BART and Muni to implement a bus-rail coordination plan in San Francisco. In 1971, with BART scheduled to begin service within eighteen months, Muni and BART agreed to again study coordination alternatives. The cooperation of the newly-formed Metropolitan Transportation Commission (MTC) was obtained and financing for the coordination study was secured by MTC from the Urban Mass Transportation Administration (UMTA). A joint-powers agreement, creating a Board of Control, was executed by BART, Muni, and MTC in late 1971. The Board appointed Mr. Gerald Cauthen as Project Director, requested proposals, and selected De Leuw, Cather & Company as consultant in early 1972.

The San Francisco Municipal Railway-Bay Area Rapid Transit (Muni-BART) Coordinated Transit Planning Project was instituted to accomplish two objectives:

1. Develop a highly organized, community-responsive transit network in San Francisco's Mission Corridor.

2. Develop a physical plan, fiscal policy, and standards of operating efficiency which emphasize coordination between the public transportation systems.

To achieve these objectives, De Leuw, Cather & Company was retained in May, 1972, to develop transit service and fare coordination plans; to suggest means of stimulating transit use; to apply traffic engineering and operations techniques to increase transit operating efficiency; to develop a community participation program which would involve the public in the planning process; and to suggest improvements to the implementation process.

STUDY APPROACH

The principal work elements of the project were arranged in three phases (see Figure 1): (1) a reconnaissance phase, in which travel, transit, and community characteristics were reviewed and initial contact was made with community groups; (2) an analysis of alternatives phase, in which immediate action items were identified and route and fare coordination options were defined and evaluated; and (3) a plan preparation phase, in which route and fare coordination plans were recommended.

STUDY AREA

The study area, or Mission Corridor, comprises a region bounded on the north and west by Market Street, Twin Peaks Tunnel, West Portal Avenue, the M streetcar line right of way, and Junipero Serra Boulevard; on the south by the San Francisco city limits; and on the east by the James Lick Freeway, Bay Bridge approach, and The Embarcadero. Figure 2 shows the boundary of the Mission Corridor, the location of the various neighborhoods within the Corridor, and the location of the BART stations within the Corridor.

The Corridor is served by nine BART stations. From north to south the stations are:

- Embarcadero
- Montgomery Street
- Powell Street
- Civic Center
- 16th Street Mission
- 24th Street Mission
- Glen Park
- Balboa Park
- Daly City

The first four stations are joint Muni-BART subway stations along Market Street.* Although the Daly City Station is actually located outside the city limits of San Francisco, it serves residents in the Parkmerced, Ocean View, and the Alemany districts of the City.

The study area encompasses approximately one-third of the land area of the City of San Francisco and roughly 30 per cent of the City's total population (over 200,000 persons in 1970), employment force, and travel demand. From central business district to suburbs, the Corridor is similar in character, density, and travel habits to the City as a whole.

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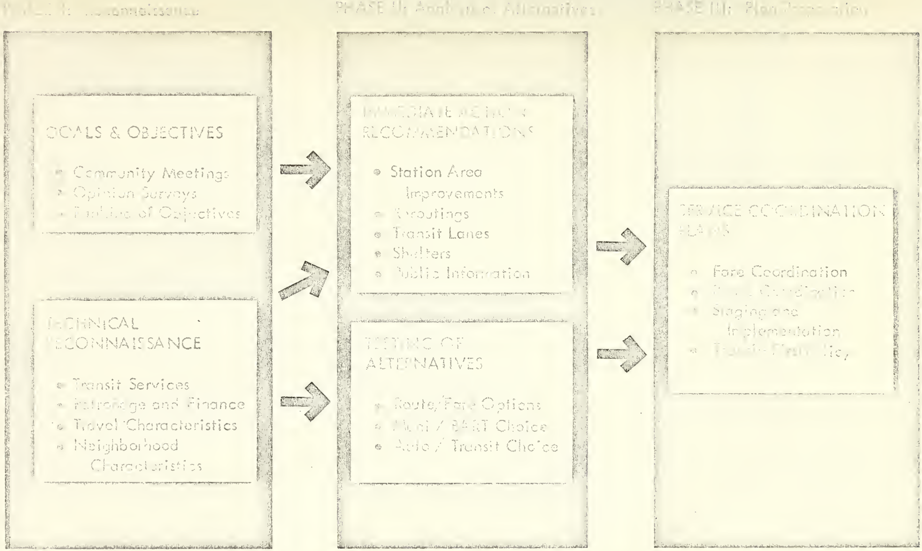
*A surface-subway transit system which would upgrade and underground the Muni streetcar lines along Market Street (referred to as Muni Metro) is currently under construction by the San Francisco Municipal Railway. It is scheduled for completion in 1976.

1. Study Approach and Organization



PHASE I: Reconnaissance

GOALS & OBJECTIVES

- Community Meetings
- Opinion Surveys
- Ranking of Objectives

TECHNICAL RECONNAISSANCE

- Transit Services
- Patronage and Finance
- Travel Characteristics
- Neighborhood Characteristics

PHASE II: Analysis of Alternatives

IMMEDIATE ACTION RECOMMENDATIONS

- Station Area Improvements
- Reroutings
- Transit Lanes
- Shelters
- Public Information

TESTING OF ALTERNATIVES

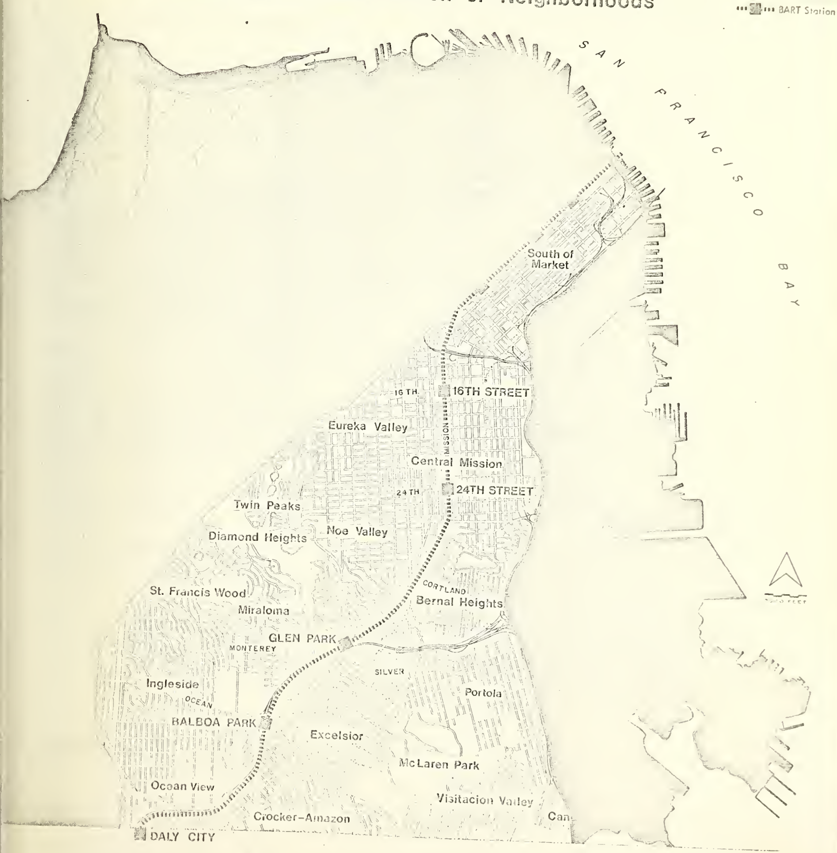
- Route/Fare Options
- Muni / BART Choice
- Auto / Transit Choice

PHASE III: Plan Preparation

SERVICE COORDINATION PLANS

- Fare Coordination
- Route Coordination
- Staging and Implementation
- Transit Priority

2. Study Area Boundaries and Location of Neighborhoods



EXISTING CONDITIONS

The 1972 network of Muni routes within the Corridor is shown on Figure 3. Table 1 summarizes the operating characteristics (fiscal year 1971-72) of the Muni transit system, both City-wide and within the Mission Corridor.

COMMUNITY SURVEY AND REVIEW PROCESSES

Efforts were made throughout the study to obtain feedback from the Mission Corridor community utilizing questionnaires; public meetings; discussions with community groups, elected officials, and their technical representatives; and an open approach in gathering lay comments and suggestions for Muni-BART coordination. From this process of assessing the community viewpoint of transit services, a statement regarding goals and objectives was developed. These goals and objectives were then ranked by neighborhood organizations in order of importance according to local priorities, and used to formulate the immediate action recommendations and the transit coordination recommendations.

Subsequently, both the immediate action proposals and the recommended coordination measures were submitted for community review. Comments from the discussion of the proposed measures were utilized to modify the final plan recommendations.

The following survey and review procedures were used during the project:

- Bus Tour. The project was initiated by inviting representatives of 40 Mission Corridor community groups to take a Saturday bus tour of the study area in order to identify transit problems.
- Transit Issues Questionnaire. A Muni-BART Coordination Study fact sheet and issue identification questionnaire (in English and Spanish) was distributed to bus tour participants and at a public meeting.
- Muni Driver Survey. With the cooperation of Muni management and the Transit Workers Union, a mailback questionnaire was distributed to 550 streetcar, trolley coach, and motor coach operators.
- Goals and Objectives Statement. Neighborhood organizations were asked to rank the proposed transit goals and objectives in an order indicating the importance of each to the community. Figure 4 summarizes the percentage of response for the various statements presented.
- Immediate Action Recommendation Hearings. Six public meetings were held at varied locations within the Mission Corridor to present the immediate action recommendations and obtain comments.
- Coordination Plan Recommendation Hearings. Two public meetings were held to present the route plan and phasing recommendations. Subsequent meetings were held with numerous community groups to obtain additional comments.

Several important conclusions were drawn from the community survey and review processes:

- Discussion of broad goals and concepts masks differences of opinion which surface only with consideration of detailed plans. These differences of opinion must be recognized so that tradeoffs can be proposed and a workable consensus can be achieved.
- Community leaders and the public must be given reason to believe in the importance of their participation in the planning process. Modification of plans in response to public sentiment, distribution of summaries of public meetings, and written response to inquiries help build good faith.
- Route revisions or service cutbacks often are strongly opposed by the community unless the advantage of a proposal is made readily apparent (and/or service additions are made in other areas). To lessen such negative reaction, Muni should make feeder service improvements and radial service cutbacks simultaneously.

Muni Routes, 1972

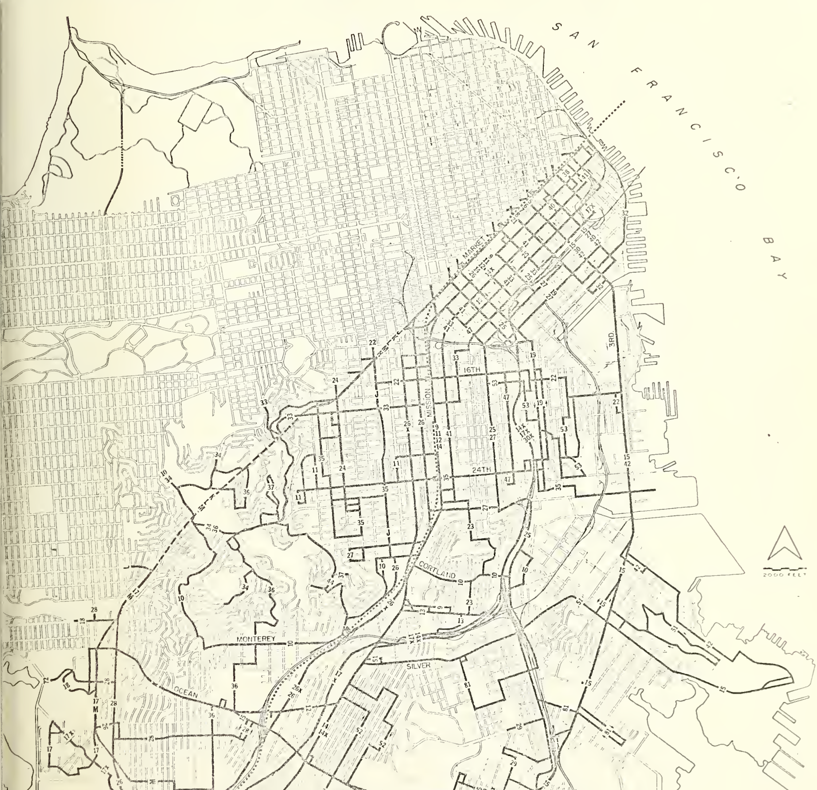


TABLE 1

MUNI OPERATING CHARACTERISTICS (Fiscal Year 1971-72)

	Entire Muni System	Mission Corridor Only	Percentage of Muni System Within Corridor
Muni Vehicle Hours	2,748,188	918,193[1]	33.0
Muni Vehicle Miles	25,224,888	8,931,459[1]	35.4
Muni Vehicle Requirements[2] (all vehicle types)	843	296[1]	35.0
Muni Round-trip Route Miles[3]	701	309[4]	44.0
Total Passengers[5]	164,781,000	50,484,000[6]	30.6
Operating Revenue	$26,363,000	$7,982,000[6]	30.0
Operating Cost	$50,674,000	$16,432,000[6]	32.4
Operating Subsidy	$24,311,000	$8,450,000	34.8

[1] Figures include the total vehicle hours, vehicle miles, or vehicle requirements of routes within or bordering on the study area and a proportion of the total vehicle hours, vehicle miles, or vehicle requirements of routes partially within the study area.

[2] Figures reflect morning peak period (7-9 AM) vehicle requirements.

[3] Round-trip route mileage measurement allows weighting of both one-way and two-way service according to the service provided. Round-trip route mileage includes the length of both directions of service on a two-directional route while single direction routes, e.g., express lines, are measured on one service length only. Figures include all scheduled routes at both peak and off-peak periods.

[4] Route mileage of lines bordering the Mission Corridor is considered as being within the Corridor.

[5] Total passenger counts include patrons using transfers as well as full-fare patrons. The number of revenue passengers (excludes patrons using transfers) is generally 25 per cent less than the number of total passengers. The total number of Muni revenue passengers for fiscal year 1971-72 was 122,621,000.

[6] Mission Corridor passenger and revenue figures include lines totally within the Corridor; a proportionate share (based on route miles) of lines operated partially within the study area; and one-half of the total route miles of lines which follow the boundaries of the study area. Lines with limited operation within the Corridor or running along the boundary are excluded from the figures (e.g., Lines 5, 6, 7, 21, and 38). Corridor operating cost figures are based on route miles and vehicle hours of operation.

Source: San Francisco Municipal Railway, Schedule and Traffic Department, and San Francisco Municipal Railway, Annual Report, Fiscal Year 1971-72

4. Ranking of Goals and Objectives

	Most Important	Quite Important	Moderately Important	Not Important	Strongly Disagree
GENERAL					
Involve citizens in planning.	•	●			
Encourage greater use of public transit as alternate to auto.	⬤				
Coordinate with other programs	•	•			
Organize transportation system to strengthen neighborhoods.	⬤	•			
TRANSIT OPERATION					
Simplify transit routing, give priority to Muni buses on City streets and speed up Muni service wherever possible.	⬤				
Provide well-planned Muni feeder service to BART Stations.	●				
Improve crosstown transit service.	•	•	•		
Improve transit services to major recreation areas.	•	•	●		
Develop transit centers at BART Stations.	•	•	•		
Provide adequate night (owl) service on major Muni routes.	•	●	•		
Reduce pollution and noise (favor electric and low polluting vehicles).	⬤				
Improve the locations of bus stops.	•	•	•		
Provide passenger shelters at major stops.	•	●	•		
Make Muni more understandable.	•	•	•		
Improve condition and appearance of Muni vehicles.	•	●	•		
FARES AND TRANSFERS					
Keep fares low.	●	•			
Simplify the Muni's transfer system.	•	•	•		
Provide convenient means of transferring from Muni to BART and from BART to Muni.	•	●			
Improve schedule coordination at major transfer points.	●	•			
FIANACING AND IMPLEMENTING					
Get maximum transit service for each dollar spent.	⬤				
Make maximum use of non-local funding sources.	●	•	•		
Increase City financing for transit service.	•		•		•
Establish procedures for periodic evaluation and revision of services to better meet needs.	●	•			
Improve communications -- public, policy makers, transit management.	●	●			
Minimize reliance on property tax.	●				
Define clear-cut responsibility for transit policy decisions and management.	●	●			
Assign sufficient resources to management to carry out responsibilities.	●	•			
Those who benefit from transit service should pay for it.	•				•

• 20-39% Responding ● 40-59% Responding ⬤ 60-100% Responding

IMMEDIATE ACTION RECOMMENDATIONS

The immediate action recommendations, a detailed description of which is contained in the mid-project report, Muni-BART Coordination -- Immediate Action Recommendations, consisted of a number of transit improvements that could be effected expeditiously, would entail minimum expenditures for implementation, and would be essentially noncontroversial.

The immediate action recommendations were submitted to the BART-Muni Coordination Board in January, 1973, for consideration and approval and for subsequent action by Muni-BART, the San Francisco Public Utilities Commission, and the San Francisco Board of Supervisors.

Most of the recommendations involved projects requiring detailed planning prior to being effected. Responsibility for design and construction of the projects was assigned to one or more of the agencies concerned with City transit development -- Muni, BART, or the San Francisco Department of Public Works.

Table 2 summarizes the immediate action recommendations -- their initial capital cost and annual operating cost and possible sources of funds for their implementation.

FARE COORDINATION RECOMMENDATIONS

Based on a comparison of the impact of three alternative fare levels,* it was felt that the magnitude of economic and community benefit was sufficient to justify the recommendation of a joint fare discount for patrons using both Muni and BART to travel within the City. The desirability of eliminating fare differences between the two transit systems, as well as offering Mission Corridor residents a form of compensation for disruptions caused by rerouting (i.e., lengthening of travel time or reduction of transfer options to some locations), present major arguments complementing quantitative financial analyses.

As a long-range objective, and with financial assistance from Federal, State, or regional sources, it is recommended that BART and Muni work toward a minimum fare differential.

JOINT FARE DISCOUNT

An initial joint fare discount of 12.5 cents was recommended for implementation. To determine the optimum price of a fare discount, a benefit/cost analysis of the alternative fare discount levels and route plans was performed. It showed that free transit feeder service would be twice as beneficial as a 12.5-cent feeder fare (i.e., a 50 per cent discount). However, since the required subsidy would be roughly proportional to the benefit derived, the issue did not appear to be whether or not the subsidy of free feeder service was a better investment than that of a lesser discount, but whether Muni and BART could make sufficient revenues available to underwrite the free feeder fare discount. Table 3 summarizes the impact of joint fare discounting on annual cost estimates for Muni and BART, predicated on the implementation of the final route coordination plan.

DISCOUNT SUBSIDY SHARING

It was recommended that the fare discount subsidy required to cover the loss of revenue resulting from implementation of the joint fare discount be shared on a fifty-fifty basis between BART and Muni. A high proportion of trips (between 52 and 66 per cent) is expected to either originate or terminate outside of the City. Such figures suggest that an equal sharing of the discount subsidy between Muni (as a local transit carrier) and BART (as an intercity or regional transit carrier) would be a reasonable approach.

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*A fare sensitivity survey of Muni riders in the Mission Corridor was undertaken to determine the perceived importance of fare pricing versus travel time. Riders were asked whether they would prefer a Muni-only ride or a joint Muni-BART ride, based on the several travel times and fare plans presented.

TABLE 2

SUMMARY OF IMMEDIATE ACTION RECOMMENDATIONS

Recommendation	Capital Costs[1]	Sources of Funds For Capital Costs	Annual Operating Costs[1]	Sources of Funds For Annual Operating Costs
1. K Line Extension and Loop at Balboa Park Station	$ 100,000	2/3 Federal[2]	$100,000	1/3 Fare Box
2. City College Streetcar Stop Loading Islands	145,000	2/3 Federal 1/3 City[3]	---	
3. Glen Park Station Area Improvements	75,000	2/5 Federal 1/5 BART 2/5 Public Works[4]	---	
4. Bus Shelters at Glen Park, 16th Street, and 24th Street BART Stations	30,000	2/3 Federal 1/3 BART	---	
5. Muni-BART Subway Interchanges	410,000	2/3 Federal 1/3 BART	10,000	BART
6. Improvement of 33/41 Lines and Provision of Transit Lane on Folsom/Howard	205,000	2/3 Federal 1/3 Hetch Hetchy	---	
7. Straighten Route of 47 Line[5]	150,000	1/3 Public Works 4/9 Federal 2/9 Hetch Hetchy	---	
8. Express Bus Route Revisions[5]	---		---	
9. First Street Improvements	10,000	Public Works	---	
10. Bus Shelters at Major Transfer Locations	45,000	2/3 Federal 1/3 City	---	
11. Transit Sign Design/Coordination	50,000	2/3 Federal 1/3 City	5,000	City Revenue Sharing
12. Printing and Distribution of Transit Schedules	15,000	2/3 Federal 1/3 City	10,000 (plus initial $20,000)	City Revenue Sharing
13. Transit System Maps	---		20,000	
	$ 764,000	Federal		
	162,000	BART	$ 20,000	Unassigned Source
	118,000	City	33,000	Farebox
	101,000	Hetch Hetchy	82,000	City Revenue Sharing
	90,000	Public Works	10,000	BART
TOTAL	$1,235,000		$145,000	

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[1] Figures are based on 1972 costs.

[2] Urban Mass Transportation Administration capital grant monies.

[3] Derived from SB 325 funds.

[4] Derived from State gasoline tax monies.

[5] Proposal superseded by final route coordination plan.

TABLE 3

IMPACT OF JOINT FARE DISCOUNT ON TRANSIT COST[1]
(Net Change From Pre-BART)

	Annual Cost (Saving)		
	25-Cent Feeder Fare	12.5-Cent Feeder Fare	Free Feeder Fare
Muni			
Fare Transfer Equipment Amortized Over Five Years	$ 0	$ 30,000	$ 30,000
Administration and Servicing	0	20,000	20,000
Passengers Diverted from Muni to BART	400,000	400,000	400,000
Passengers Diverted from Muni to Muni-BART	0	1,810,000	4,000,000
Persons Diverted from Auto to Muni-BART	(170,000)	(110,000)	0
Subsidy of Joint Fare Discount (payment from BART to Muni)[2]	0	(980,000)	(2,140,000)
Total, Muni	$ 230,000	$1,170,000	$2,310,000
BART			
Passengers Diverted from Muni to BART	($ 480,000)	($ 480,000)	($ 480,000)
Passengers Diverted from Muni to Muni-BART	(3,900,000)	(4,350,000)	(4,800,000)
Persons Diverted from Auto to Muni-BART	(210,000)	(270,000)	(330,000)
Subsidy of Joint Fare Discount (payment from BART to Muni)[2]	0	940,000	2,140,000
Total, BART	($4,590,000)	($4,160,000)	($3,470,000)

[1] Cost figures attributable to route coordination have been excluded from consideration.

[2] Assumes a BART subsidy of 50 per cent of the discount of every feeder bus ride, i.e., 6.25 cents per transferring passenger for the 12.5-cent feeder fare plan (50 per cent of 25 cents minus 12.5 cents), and 12.5 cents per transferring passenger for the free feeder fare plan.

in the future more sophisticated formulas for subsidy sharing among all the Bay Area transit operators should be explored, perhaps based on origins and destinations of riders, unit costs of service, and/or passenger miles.

MUNI-BART TRANSFER

The final element in the development of the fare coordination plan was the selection of a transfer procedure to implement the Muni-BART joint fare discount. Several transfer procedures were analyzed using fourteen criteria to determine their ability to accommodate the needs of the Muni-BART transit systems:

Primary Criteria

1. Avoid looping/directional bias
2. Provide flexibility in fare discount pricing
3. Promote rider convenience/understanding
4. Minimize interference with driver
5. Reduce opportunities for cheating

Secondary Criteria

6. Permit Muni-BART-Muni transfers
7. Permit Muni-Muni-BART or BART-Muni-Muni transfers
8. Facilitate AC Transit-BART-Muni transfers
9. Minimize interference with BART ticketing procedures
10. Require minimum capital investment
11. Require simple administrative and accounting practices
12. Minimize number of times rider must pay fare
13. Provide transfer for use by all classes of riders (e.g., seniors, youths)
14. Permit potential application to other transit carriers (e.g., Golden Gate Transit, Southern Pacific)

The recommended transfer is a two-part ticket, shown in Figure 5. The ticket, dispensed by a machine activated by coin insert, would be color coded by BART station. One end of the ticket would be longer than the other to assist Muni drivers in detecting improper usage. Issued to passengers when leaving the BART system, one end of the ticket would be used for a trip away from a BART station (within a specified time); the other end would be used for a return trip to a BART station.

LONG-RANGE TRANSFER OBJECTIVES

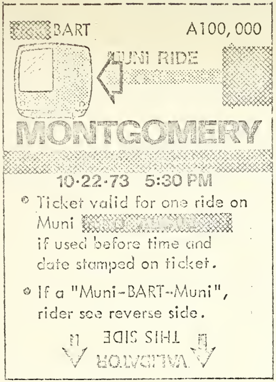
In the future it should be possible to develop more innovative transfer arrangements to and from BART and other long-haul transit carriers. Use of the BART stored-fare card, in particular, would offer a number of advantages such as:

- Reducing the number of times a transit user must have exact change or handle cash.
- Standardizing transfer procedures between BART and other long-haul carriers.
- Allowing payment of BART feeder transportation using the card.
- Crediting patrons for BART fare paid aboard the transit feeder system.

ROUTE COORDINATION RECOMMENDATIONS

The recommendations for a Muni rerouting plan represented the culmination of a one-year effort during which numerous alternatives were modeled and tested by computer analysis.* Route options were evaluated not only from the standpoint of technical feasibility, but also in terms of responsiveness to community needs gained during presentation of the immediate action recommendations at public meetings. Familiarization with

5. Recommended Two-Part Muni-BART Transfer


BART A100,000

MUNI RIDE

MONTGOMERY

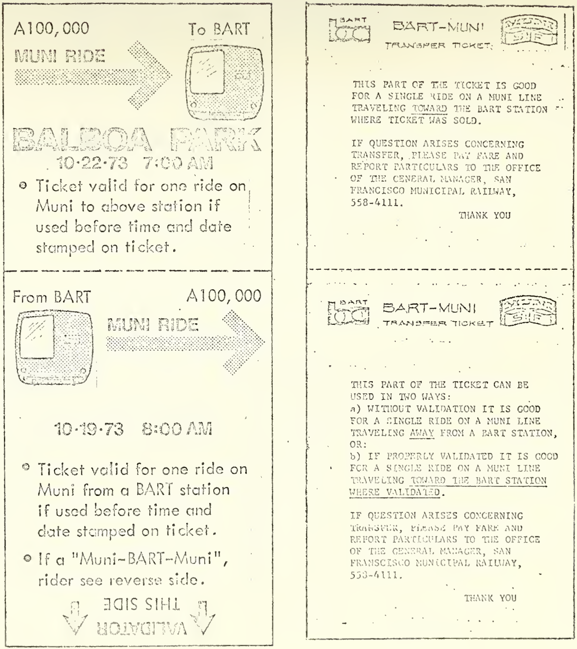
10-22-73 5:30 PM

- Ticket valid for one ride on Muni
  if used before time and date stamped on ticket.
- If a "Muni-BART-Muni", rider see reverse side.

THIS SIDE

VALIDATOR

Ticket as converted in validator at Montgomery Street Station


A100,000 To BART

MUNI RIDE

BALBOA PARK

10-22-73 7:00 AM

- Ticket valid for one ride on Muni to above station if used before time and date stamped on ticket.

From BART A100,000

MUNI RIDE

10-19-73 8:00 AM

- Ticket valid for one ride on Muni from a BART station if used before time and date stamped on ticket.
- If a "Muni-BART-Muni", rider see reverse side.

THIS SIDE

VALIDATOR

BART BART-MUNI TRANSFER TICKET MUNI

THIS PART OF THE TICKET IS GOOD FOR A SINGLE RIDE ON A MUNI LINE TRAVELING TOWARD THE BART STATION WHERE TICKET WAS SOLD.

IF QUESTION ARISES CONCERNING TRANSFER, PLEASE PAY FARE AND REPORT PARTICULARS TO THE OFFICE OF THE GENERAL MANAGER, SAN FRANCISCO MUNICIPAL RAILWAY, 558-4111.

THANK YOU

BART BART-MUNI TRANSFER TICKET MUNI

THIS PART OF THE TICKET CAN BE USED IN TWO WAYS:

a) WITHOUT VALIDATION IT IS GOOD FOR A SINGLE RIDE ON A MUNI LINE TRAVELING AWAY FROM A BART STATION, OR:

b) IF PROPERLY VALIDATED IT IS GOOD FOR A SINGLE RIDE ON A MUNI LINE TRAVELING TOWARD THE BART STATION WHERE VALIDATED.

IF QUESTION ARISES CONCERNING TRANSFER, PLEASE PAY FARE AND REPORT PARTICULARS TO THE OFFICE OF THE GENERAL MANAGER, SAN FRANSCISCO MUNICIPAL RAILWAY, 558-4111.

THANK YOU

Ticket as issued with Station, date and time stamped by machine

technical and community concerns led to the specification of principles around which the route coordination recommendations were developed:

- Run circumferential Muni routes past BART and Muni Metro stations.
- Complement the major crosstown feeder lines with minor crosstown and local feeder lines which radiate from each BART station.
- Allocate existing transit vehicles and manpower to the new route network to attain the greatest transit ridership.
- Replace underutilized transit routes that run parallel to the BART alignment with new BART-feeder lines.
- Maintain policy headways of 10-minute peak period/15-minute off-peak period for BART-feeder lines.
- Select headways that are even increments of one hour, e.g., 3, 4, 5, 6, 7.5, and 10 minutes, to facilitate patrons' ability to remember schedules.

Within the framework of these coordination objectives, detailed route alignments were modified to incorporate local preferences.

Ultimately a four-phase route coordination plan was formulated, staged to coincide with: (1) commencement of BART operation in San Francisco; (2) implementation of joint Muni-BART fare discount; (3) commencement of BART operation on a full service schedule; and (4) completion of the Muni Metro. In addition, a number of supplementary route recommendations were included, to be implemented at the discretion of Muni.

The final route coordination recommendations are summarized in numerical order by phase in Table 4. Included are line headways (AM peak period, base or midday, PM peak period, and evening), estimated annual operating cost (increase or saving), and estimated capital cost. Figure 6 illustrates the final route plan, and Figures 7, 8, 9, 10, and 11 show the route changes for Phases I, II, III, IV, and the Supplementary Recommendations, respectively.

Route extensions and headway improvements should be initiated on a trial basis for a period of nine months. The overall performance of the extended lines should be monitored carefully to determine any significant increases (or decreases) in cost/benefit ($1.00 per revenue passenger carried is suggested as the maximum acceptable cost). If, at the end of the trial period, benefit is found not to be sufficient, the route extensions should be eliminated and the equipment and manpower utilized elsewhere in the system. The decision to continue use of the recommended headways should be predicated upon increases in feeder bus patronage and traffic congestion in the BART station areas greater than anticipated at this time.

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*A transit travel behavior model was developed to simulate passenger preference for direction of travel and choice between Muni and BART, based on travel time and fare (converted to a time equivalent). Three alternative Muni route coordination plans involving (1) no rerouting, (2) limited rerouting, and (3) major reorientation of routes, and three Muni-BART fare discount plans involving (1) full fare or 25 cents, (2) 50 per cent discount or 12.5 cents, and (3) free fare, were analyzed by computer simulation -- using the behavior model -- to determine their impact on travel patterns in conjunction with the commencement of BART service in San Francisco.

TABLE 4

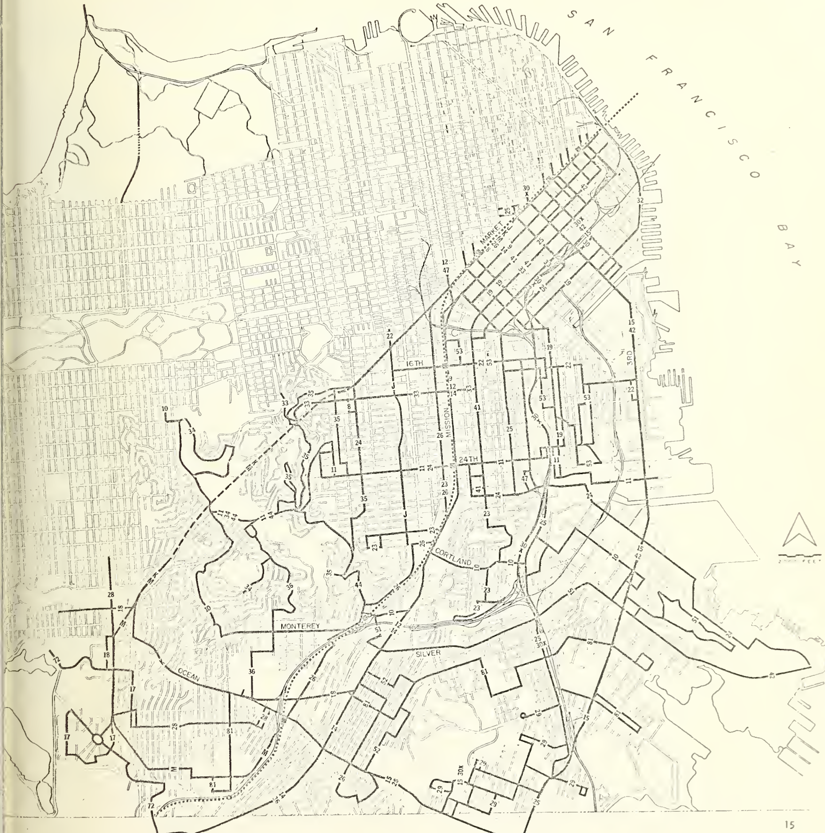
SUMMARY OF FINAL PLAN RECOMMENDATIONS[1]

Route Change	Headways (in minutes)				Estimated Annual Operating Cost Increase (Saving)	Estimated Capital Cost
	AM Peak (7-9 AM)	Base or Midday (9 AM-4 PM)	PM Peak (4-6 PM)	Evening (6 PM-12 AM)		
Phase I						
Extend 23	15	15	15	20	$101,000	$ 0
Combine 25/80	6	12.5	5	15	116,000	0
Extend 51	3	15	12	24	97,000	0
Extend 53	15	15	15	20	49,000	0
Subtotal, Phase I					$363,000	$ 0
Phase II						
Reroute 10	7.5	11	8.5	15	($ 40,000)	$ 0
Adjust 14GL headways	12	--	11	--	(27,000)	0
Eliminate 14L	--	--	--	--	(493,000)	0
Adjust 14X headways	10	--	12	--	(171,000)	0
Through-route 15	4	7	6	15	91,000	0
Adjust 17X headways	13.5	--	13.5	--	(137,000)	0
Shorten, reroute 26	14	10	10	18	(92,000)	0
Eliminate 26X	--	--	--	--	(67,000)	0
Shorten 30X	2	6	3	--	(152,000)	0
Reroute 36	10	15	10	20	105,000	0
Combine 44/51	10	15	10	20	(98,000)	0
Adjust 52 headways	20	20	20	20	(19,000)	0
Extend 72	8	15	7	15	206,000	0
Reroute, extend 81	10	15	10	20	324,000	0
Extend K	4.5	7.5	4	15	138,000	245,000
Subtotal, Phase II					($432,000)	$245,000
Phase III						
Extend 10	7.5	11	8.5	15	$ 79,000	$ 0
Reroute 12	5	10	5	10	153,000	0
Combine 13/23/27	10	15	10	20	(705,000)	0
Eliminate 14GL	--	--	--	--	(68,000)	0
Eliminate 14X	--	--	--	--	(81,000)	0
Eliminate 17X	--	--	--	--	(67,000)	0
Extend 24	7.5	10	8.5	16	680,000	0
Reroute 42	7	10	6	15	(77,000)	0
Adjust 47 headways	5	10	5	10	(585,000)	0
Adjust 53 headways	10	15	10	20	33,000	0
Subtotal, Phase III					($628,000)	$ 0
Phase IV						
Reroute 11	7.5	15	8.5	15	($ 47,000)	$ 0
Shorten 17	10	20	10	20	(12,000)	0
Reroute, extend 26	10	10	10	20	173,000	0
Reroute, extend 28	5	12	5	20	0	0
Combine 35/37	10	15	10	20	(317,000)	0
Extend M	8.5	7.5	6	30	92,000	550,000
Subtotal, Phase IV					($111,000)	$550,000
Supplementary Recommendations[2]						
Reroute 15, 42	No Headway Change				$ 0	$ 0
Reroute 33	10	15	10	20	0	0
Reroute 41	8	12	8	--	0	0
Extend 47	No Headway Change				0	0

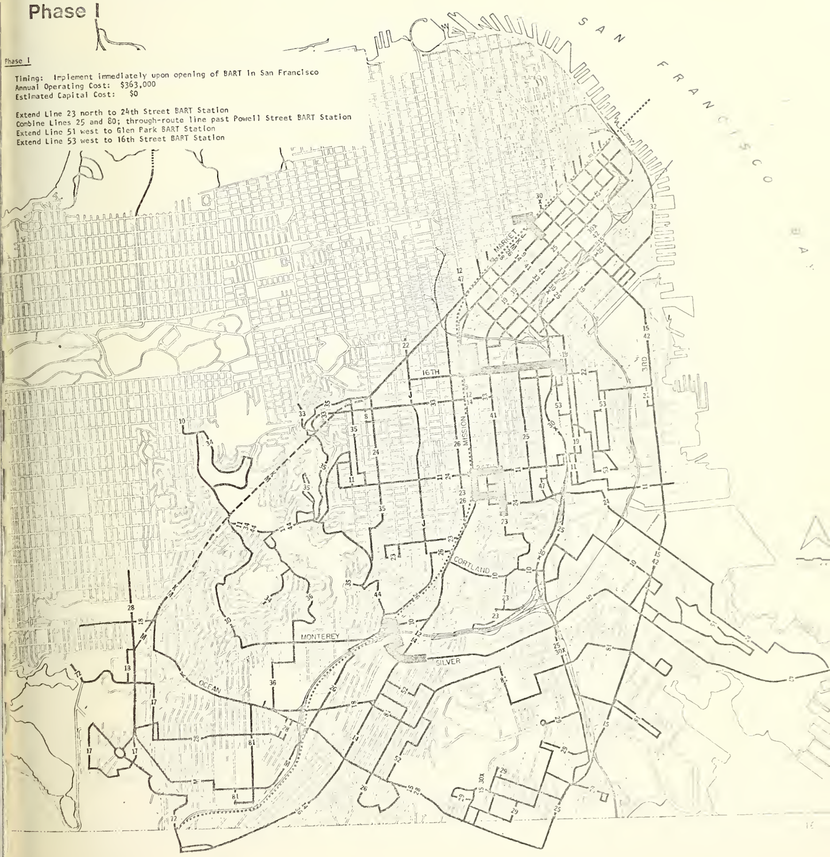
[1] Cost estimates are based on revenue-producing mileage, average route operating speeds, and 1972 Muni costs per vehicle hour and per vehicle mile, inflated by 20 per cent to represent 1974 costs. Annual operating cost estimates do not include allowances for travel to and from storage/maintenance facilities (deadheading), scheduling of vehicles to cover several routes (interlining), or compensation of drivers for overtime or layover during midday. Although detailed scheduling may alter the cost of individual route changes, phasing costs should be the correct order of magnitude.

[2] An additional Supplementary Recommendation is the operation of small transit vehicles on neighborhood routes.

. Final Route Plan



7. Final Route Plan
Phase I



Phase I

Timing: Implement immediately upon opening of BART in San Francisco
Annual Operating Cost: $363,000
Estimated Capital Cost: $0

Extend Line 23 north to 24th Street BART Station
Combine Lines 25 and 80; through-route line past Powell Street BART Station
Extend Line 51 west to Glen Park BART Station
Extend Line 53 west to 16th Street BART Station

8. Final Route Plan
Phase II

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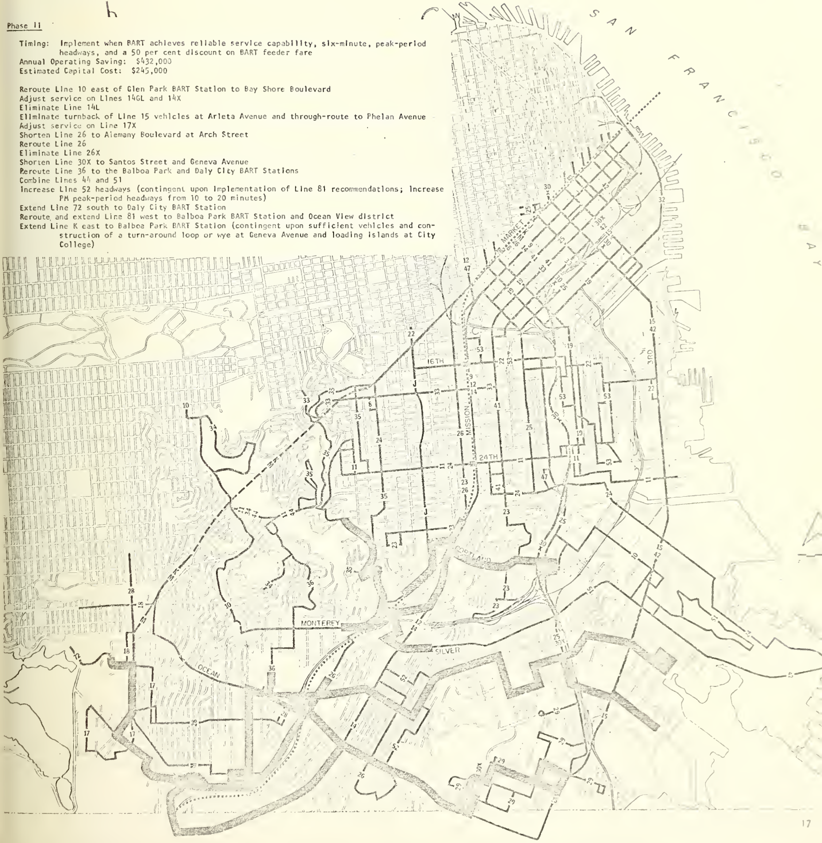
Phase II

Timing: Implement when BART achieves reliable service capability, six-minute, peak-period headways, and a 50 per cent discount on BART feeder fare
Annual Operating Saving: $432,000
Estimated Capital Cost: $245,000

Reroute Line 10 east of Glen Park BART Station to Bay Shore Boulevard
Adjust service on Lines 14GL and 14X
Eliminate Line 14L
Eliminate turnback of Line 15 vehicles at Arleta Avenue and through-route to Phelan Avenue
Adjust service on Line 17X
Shorten Line 26 to Alemany Boulevard at Arch Street
Reroute Line 26
Eliminate Line 26X
Shorten Line 30X to Santos Street and Geneva Avenue
Reroute Line 36 to the Balboa Park and Daly City BART Stations
Combine Lines 44 and 51
Increase Line 52 headways (contingent upon implementation of Line 81 recommendations; increase PM peak-period headways from 10 to 20 minutes)
Extend Line 72 south to Daly City BART Station
Reroute and extend Line 81 west to Balboa Park BART Station and Ocean View district
Extend Line K east to Balboa Park BART Station (contingent upon sufficient vehicles and construction of a turn-around loop or wye at Geneva Avenue and loading islands at City College)



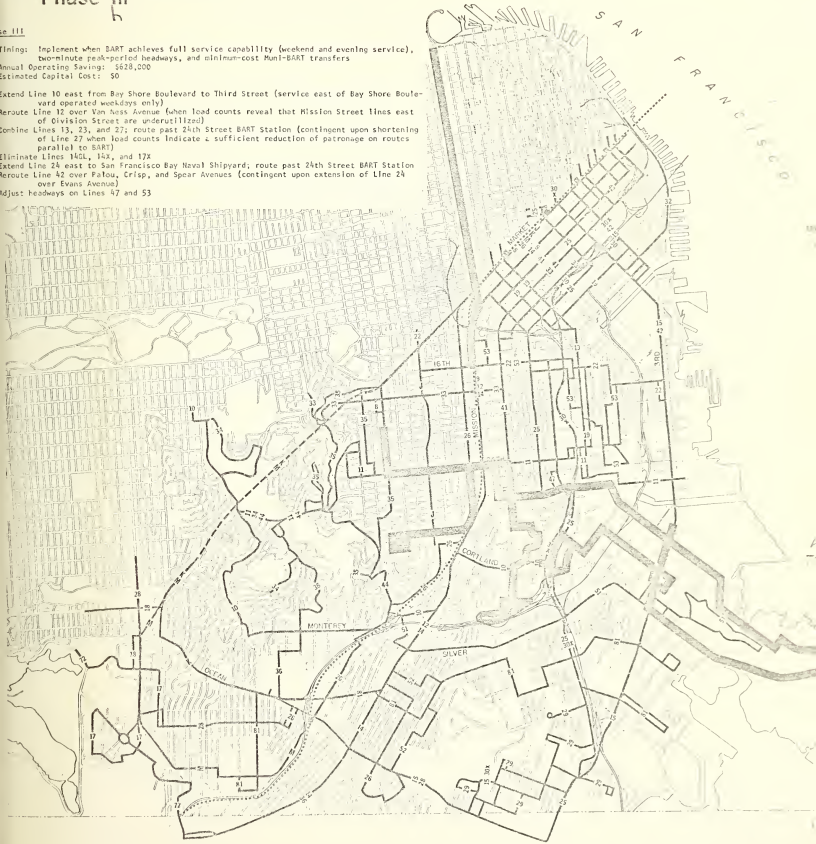
9. Final Route Plan

Phase III

Phase III

Timing: Implement when BART achieves full service capability (weekend and evening service), two-minute peak-period headways, and minimum-cost Muni-BART transfers
Annual Operating Saving: $628,000
Estimated Capital Cost: $0

Extend Line 10 east from Bay Shore Boulevard to Third Street (service east of Bay Shore Boulevard operated weekdays only)
Reroute Line 12 over Van Ness Avenue (when load counts reveal that Mission Street lines east of Division Street are underutilized)
Combine Lines 13, 23, and 27; route past 24th Street BART Station (contingent upon shortening of Line 27 when load counts indicate a sufficient reduction of patronage on routes parallel to BART)
Eliminate Lines 14GL, 14X, and 17X
Extend Line 24 east to San Francisco Bay Naval Shipyard; route past 24th Street BART Station
Reroute Line 42 over Palou, Crisp, and Spear Avenues (contingent upon extension of Line 24 over Evans Avenue)
Adjust headways on Lines 47 and 53

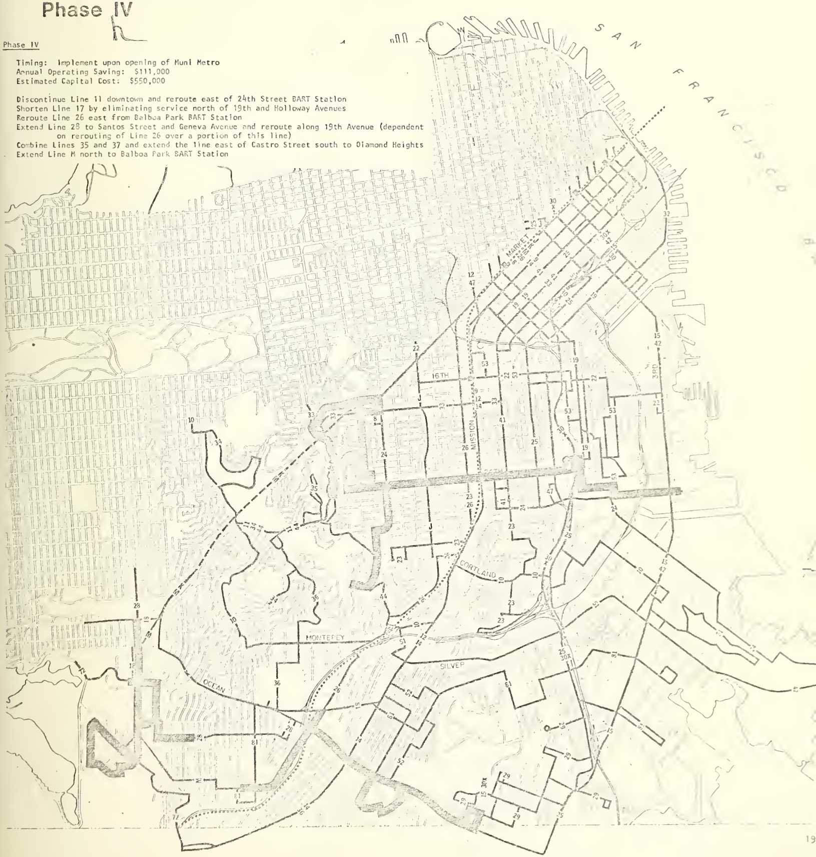


10. Final Route Plan
Phase IV

Phase IV

Timing: Implement upon opening of Muni Metro
Annual Operating Saving: $111,000
Estimated Capital Cost: $550,000

Discontinue Line 11 downtown and reroute east of 24th Street BART Station
Shorten Line 17 by eliminating service north of 19th and Holloway Avenues
Reroute Line 26 east from Balboa Park BART Station
Extend Line 28 to Santos Street and Geneva Avenue and reroute along 19th Avenue (dependent on rerouting of Line 26 over a portion of this line)
Combine Lines 35 and 37 and extend the line east of Castro Street south to Diamond Heights
Extend Line M north to Balboa Park BART Station



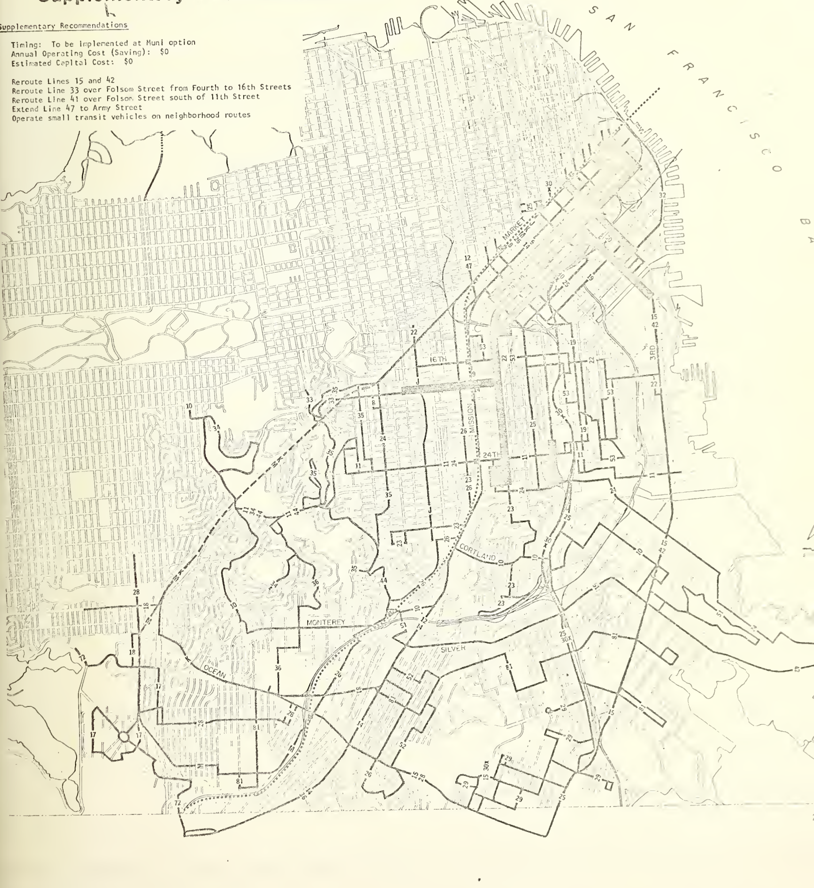
TE
ARY RECOMMENDATIONS

II. Final Route Plan Supplementary Recommendations

Supplementary Recommendations

Timing: To be implemented at Muni option
Annual Operating Cost (Saving): $0
Estimated Capital Cost: $0

Reroute Lines 15 and 42
Reroute Line 33 over Folsom Street from Fourth to 16th Streets
Reroute Line 41 over Folsom Street south of 11th Street
Extend Line 47 to Army Street
Operate small transit vehicles on neighborhood routes



TRANSIT-FIRST POLICY

The following strategies for improving transit vehicle movements within the Mission Corridor are recommended to implement the San Francisco Board of Supervisors' transit-first policy, established by resolution in March, 1973:

- Provide exclusive transit lanes, synchronized and/or transit-preempted traffic signals, center-street boarding islands and/or bulb curb extensions, turn prohibitions, and strict enforcement of parking regulations on four major streets within the Mission Corridor: Market, Mission, Third, and Fourth Streets. Of these streets, the most critical is the portion of Third Street, between Brannan and Market Streets, which carries traffic from the freeways to the downtown area. This particular street will not be relieved of its traffic burden with the opening of either BART or Muni Metro.
- Use priority transit treatment such as transit-favored signal timing, transit preempted traffic signals, and turning movement prohibitions on 16th and 24th Streets and Geneva Avenue (especially if the recommendations for coordination of routes are adopted).
- Remove stop signs along the transit vehicle corridor (while providing stop signs on intersecting streets) on San Bruno and Potrero Avenues, the Visitacion Valley routes of the 15 and 30X lines, Crescent and Silver Avenues, Monterey and Castro Streets, and the M streetcar route. (Since a number of these streets are narrow, enforcement of parking regulations and use of transit stop bulbs would also alleviate traffic problems.) Traffic signals on these streets should be phased to favor the transit route, perhaps by employing semi-actuated signals which give very short breaks (5-10 seconds) for traffic movement on intersecting streets.
- Provide a separate right of way (such as that being developed for the N streetcar line on Judah Street) on West Portal Avenue and Church Street, particularly between 18th and Market Streets, and on Ocean Avenue, between Phelan and Victoria Streets. Turn prohibitions and transit-preempted traffic signals should accompany the separate rights of way.

Technical and procedural memoranda and reports prepared as a part of this study include:

- Description of Procedures Memorandum
- Technical Memorandum No. 1 -- Travel Patterns
- Technical Memorandum No. 2 -- Muni Zones
- Technical Memorandum No. 3 -- Network Description
- Technical Memorandum No. 4 -- Muni-BART Trip Table
- Technical Memorandum No. 5 -- Muni-BART Mode Split
- Memorandum on Community Surveys and Public Meetings
- Sensitivity of Patronage to Joint Fare Discount Pricing (by Mortimer Associates)
- Muni-BART Coordination -- Immediate Action Recommendations (midterm report)
- Muni-BART Coordination -- Technical Report